at large, I do not believe he is averse from employing crucial tests. His difficulty in the manifold processes of life is to formulate tests that really are crucial. Sir Archdall Reid thinks it an easy matter, and he takes recapitulation as an instance. At the moment when his letter was published some of us were discussing that very question at the Linnean Society, and Sir Archdall Reid, had he been present, would have seen that the issue was far from being the simple one that he imagines.

F. A. BATHER.

June 4.

A New Acoustical Phenomenon.

WHEN living near Croydon aerodrome during the earlier part of the war, I noticed that the higher-pitched sounds apparently given out from an aeroplane flying nearly overhead varied with the height of my ear above the ground; thus, by bending down to one-half one's normal height, the pitch of this higher note rose an octave. I have on many recent occasions confirmed this result. This phenomenon is most noticeable when standing on a smooth road or lawn, and is scarcely distinguishable on a rougher surface, such as a hayfield; the logical conclusion is therefore that it is due in some manner to reflection from the ground. The pitch of the note varies also with the angle of elevation of the aeroplane, and is not generally audible unless this is more than about 45°. Since the pitch rises continuously as the head is lowered, the apparent explanation is that the note is due to the interval between the arrival of the direct and reflected waves from impulses radiated from the aeroplane—that is to say, no note of this definite pitch comes through the air from the aeroplane, only a regular, or irregular, succession of impulses, the time periods of which have no relation to the observed note, for it is obvious that merely bowing to the aeroplane could not alter the pitch of any note it might be giving out. (It is well known that a note of much lower pitch, due to the engine, is always present, but it is not in this sound that the variation takes place, although it is possible that these are the waves from which the variable high note is produced by reflection.) The pitch of the sound with which we are concerned is thus due to the fixed interval between the arrival of the direct and reflected impulses, and thus depends upon the height of the observer and the angle of elevation of the aeroplane. An interesting deduction from the discovery is that the ear is able to appreciate pitch from a succession of double impulses, if the interval between the elements of each double impulse is constant.

The phenomenon is not in any way peculiar to aeroplane noises; I have observed it with equal distinctness, though the sound was fainter, when standing under an aspen tree in a light breeze. Through the rustle of the leaves could be distinguished a note of quite definite pitch, which, as before, rose to its octave on lowering the head to half one's height.

In support of the explanation I have given, it may be remarked that the pitch of the note observed seems to correspond with the interval of time between the arrival at the ear of the direct and reflected impulses as calculated from the velocity of sound in air.

From the physiological point of view it would be interesting to make a laboratory test, using a disc siren with the holes pierced in groups of two, all pairs being similar to one another, but grouped at unequal spaces on the circumference; thus the passage of each pair would give a double puff, but the double puffs would be in an irregular succession. This would, no doubt, give a definite note corresponding in pitch to the interval between members of a pair of holes, and would be a further confirmation of my explanation.

That two impulses alone appear to give a sense of definite pitch is interesting, and seems to indicate the existence of a resonating system in the ear. Experiments such as I have suggested, with a disc siren, might therefore help in the solution of the much-discussed problem of the function of Corti's organ. Another and more general series of experiments would have the object of finding whether, as is indicated by my observations, all sounds when heard by an observer near a reflecting surface have, in addition to the incoming fundamental note, a note of a pitch depending on the distance of the observer from the reflector. This phenomenon is known to have occurred, as regards electric waves, in Hertz's classical experiments. Unfortunately press of other research work prevents me from carrying out tests in this fascinating subject, but perhaps someone more directly interested may find time to develop it further.

J. ERSKINE-MURRAY.

Directorate of Research,
Air Ministry, Kingsway, London, W.C.2.
June 7.

Herons and Fish.

IT was commonly believed and asserted by old-time writers on natural history that from the feet and legs of the common heron exuded an oil with a peculiar odour which attracted fish within striking distance of the bird's powerful beak. Anglers used to mix the fat of a heron with flour and other matter and anoint their baits with it, whereby, says John Jonston in his "Historia Naturalis" (1657), "mirifice pisces illiciuntur."

I have never regarded this theory as of greater value than many others propounded by medieval empirics, but it was recently brought vividly to mind by what has taken place in the garden of one of my country neighbours. In this garden there is a rectangular pond measuring about 30 ft. by 20 ft. The sides are of dressed masonry, which extends under 9 in. of water so as to form a continuous ledge a yard broad, beyond which the depth drops suddenly to between 3–4 ft., wherein some of Marliac's water-lilies are grown. The pond was stocked with goldfish, which throve well until a heron found its way there, and has succeeded in exterminating them. The owner of the garden, a good observer upon whose statement I can rely, tells me that the bird always took its stand in one corner of the pond, on the ledge covered by the shallow water, and that the goldfish moved out of the deep water into the centre and congregated round the heron, who picked them up at leisure. Had the fish remained in the deep water which they usually inhabited, of course the heron could not have reached them.

Although I draw no inference from this incident, it seems worth mentioning. It would be interesting to hear of an authentic parallel case.

HERBERT MAXWELL.

Monreith, Wigtownshire.

Why do Worms Die?

MANY times during the last twenty years I have been tempted to make the following communication. My house backs on to, and is partly built into, the old cliff at St. Leonards-on-Sea, and my back door opens on to a road cut into the face of the cliff. The road is well tar-macadamed and watertight. The esplanade at St. Leonards is wide, tar-gritted, and

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watertight, and it contains a number of ornamental flower-beds surrounded by low brick and cement walls, surmounted by cornices which overhang 2–3 in. The surfaces of the beds are about 12 in. below the top of the walls.

On certain occasions I find worms in the back street, generally of medium to a rather large size, which have the appearance of being "drowned," although it is very rarely that life is extinct. On the esplanade they are present in large numbers. They occur at all points between the beds and the sea-wall, over which many of them must pass, for one can find them on the watertight stone undercliff. One naturally expects worms to rise after rain, but in a wet season I have known eleven wet days in succession without a single worm appearing, while on the twelfth day large numbers were to be found on the pavements, the road, and the back street. On the other hand, I have known them to occur after a rainstorm following dry weather. In several years the dates in November and January have coincided. The first thing that strikes one is that the phenomenon occurs only at long intervals, and then such large numbers participate in it. At other times one may never see a single worm. I have often wondered if it were in response to a migratory instinct.

The mystery is how these worms mount a wall 12 in. high and negotiate the overhanging cornice. On several occasions I have known quantities of "whitebait" and other things that occur at the surface of sea-water similarly strewn upon the esplanade and roads, and I have been tempted to ask if these worms have not been caught up similarly and returned to earth with the rain. W. J. LEWIS ABBOTT.

I THINK Sir Ray Lankester (NATURE, June 2, p. 424) will agree with me that earthworms when underground must frequently or usually be in contact with other moist surfaces. My impression is that in dry weather, when the upper layers of soil contain only adsorbed water and are what we call "dry," earthworms seek the lower layers where the particles are moist—that is, are surrounded by a surface film of liquid water, however thin this may be. When in such a moist layer the surface of the worm must at many points be obtaining its air-supply through the medium of water which is not part of itself. The air, as Sir Ray Lankester says, reaches the worm through the porous soil, and I think in part through the moisture on the surface of the particles. The statement in my letter in NATURE of May 19 can admittedly be read as implying that the worm was partly dipped in slime or mud, but this was far from my meaning. J. H. COSTE.

Teddington.

Vitality of Gorse-seed.

BY way of supplementing my letter to NATURE of September 26, 1918 (vol. cii., p. 65), on the above subject, it may be of interest to record the fact that the seedlings arising from seed which has lain dormant in the soil for a quarter of a century have produced vigorous plants. A small part of the 20-acre field was not reploughed owing to its steepness, and the gorse seedlings which came up on it after the war-ploughing of the winter 1917–18 have been allowed to grow. They are now in their fourth season of growth, and are good-sized bushes averaging 2 ft. in height, which have been this spring a mass of bloom, like the gorse generally in this district and I believe, throughout the country.

I can also add another year, making twenty-six in all, to the vitality of buried gorse-seed; the field in question, save for the above-mentioned steep slope, was reploughed in the winter 1918–19, with the result that a fresh crop of gorse seedlings appeared the following summer. The field has now reverted to grass, and these two-year-old seedlings are being grubbed up. JOHN PARKIN.

The Gill, Brayton, Cumberland, June 3.

Habits of the Hedgehog.

IN the article on the hedgehog which appeared in NATURE of May 19, p. 375, mention is made of the widespread belief that hedgehogs suck the teats of cows. Although farmers have assured me that they have found evidence of milk on the hedgehog, I do not think that any credence can be given to the statement. The belief probably arises from the extrusion of the contents of the vesiculæ seminales of the buck hedgehog when crushed, kicked, or otherwise injured. The vesiculæ seminales are, when full, extraordinarily large in proportion to the size of the animal, and the milky fluid can easily be mistaken for cow's milk, especially when the hedgehog has rolled itself up for defensive purposes and the face has become smeared with the seminal fluid.

That hedgehogs will eat young birds I have had personal experience, but I doubt if they do much damage to game in this way.

In 1906 and 1907 several albino hedgehogs were found at Goathland, Yorkshire. I attempted to cross an albino doe with a normal buck, but when placed together the latter promptly attacked and killed it. In attempting to breed them in semi-captivity, *i.e.* in a large walled garden, I found that the bucks harried the does a good deal, thus rendering it difficult to secure a litter, and that if the nest was disturbed the mother would frequently eat her young. This proved a real difficulty in the experiments. G. A. AUDEN.

Birmingham, May 29.

Principles of Picture-hanging.

THERE is no need for picture-wire (NATURE, May 19, p. 362; May 26, p. 395; June 2, p. 438) if the principle is adopted described in the *Times Engineering Supplement* of April, 1919, of the application of Kelvin's Five-Point principle to the picture-hanging.

A rail, say of black enamelled electric conduit tube, is supported along the wall at an appropriate height on bracket-hooks fixed in the wall, and the pictures are hung on the rail by two bent iron hooks fastened on the back of the upper edge of the frame. This gives four points of contact, and the fifth is made by a round-headed screw in the lower edge to set the face at an appropriate cant. One degree of freedom is still left of a motion of the picture sideways into the desired place. A picture is lifted off in a trice and thrown out of the window in case of fire, as of a gallery of portraits in an old mansion; and the pictures can be hung over each other, two and three deep if space is limited, as in the Royal Academy.

The principle is appropriate in a modern physical workshop for the support of apparatus, however heavy, bracketed out from the wall, if a plate is built into a course with a projecting lip. A nail cannot be driven into the glazed-brick wall, but a picture-board can be kept for that purpose and placed where required. The difficulty is avoided of the suspension of apparatus from the roof or ceiling.

The principle seems to have been employed in the Pinacotheca of the ancient Acropolis of Athens. G. GREENHILL.

1 Staple Inn, W.C.1, June 6.

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